

What is Claimed is:

1. A method of pinpointing the physical position of a target communication device, comprising:

(a) determining a position of the target communication with sufficient accuracy to  
5 direct a search communication device to within a vicinity of the target communication device;

(b) repeatedly measuring the range between the target communication device and the mobile search communication device once the search communication device is within the vicinity by repeatedly exchanging an outbound ranging signal and a reply ranging signal  
10 between the target communication device and the search communication device and determining a round-trip signal propagation time of the outbound ranging signal and the reply ranging signal; and

(c) directing movement of the search communication device toward the target communication device in response to the repeatedly measured range, thereby pinpointing the  
15 position of the target communication device by reducing the range between the search and target communication devices.

2. The method of claim 1, wherein (a) includes determining the position of the target communication device from measurements of ranges between the target communication device and reference communication devices whose positions are known.

20 3. The method of claim 1, wherein (a) includes determining the position of the target communication device based upon a position entered manually via a user interface.

4. The method of claim 1, wherein the target communication device initiates a search for itself by broadcasting a search mode request.

5. The method of claim 1, wherein a central control device initiates a search for the target communication device by broadcasting a search mode request to potential search devices.

6. The method of claim 5, wherein communication devices not within the vicinity of the target communication device retransmit search mode requests broadcasted by the central control device, thereby extending the broadcast range of the central control device.

5 7. The method of claim 1, wherein the search communication device initiates a search for the target communication device by transmitting a search mode request to the target communication device.

8. A search communication device for pinpointing the physical position of a target communication device in a vicinity of the search communication device, comprising:

10 a transmitter configured to transmit an outbound ranging signal to the target communication device;

a receiver configured to receive a reply ranging signal from the reference communication device in response to the outbound ranging signal; and

15 a processor configured to determine the range to the target communication device from a round-trip signal propagation time of the reply ranging signal and the outbound ranging signal, wherein;

20 said search communication device is configurable to operate in a search mode in which said search communication device repeatedly determines the range to the target communication device to enable an operator to direct movement of the search communication device toward the target communication device, thereby pinpointing the position of the target communication device by reducing the range between the search and target communication devices.

9. The search communication device of claim 8, wherein said search communication device is initially directed to a vicinity of the target communication device by an estimate of the position of the target communication device determined measurements of ranges between  
25 the target communication device and reference communication devices whose positions are known.

10. The search communication device of claim 8, wherein said search communication device is initially directed to a vicinity of the target communication device based on a position of the target communication device entered manually via a user interface.

11. The search communication device of claim 8, wherein the search mode is initiated by a broadcast search mode request transmitted by the target communication device.

12. The search communication device of claim 8, wherein the search mode is initiated by a broadcast search mode request transmitted by a central control device.

5 13. The search communication device of claim 12, wherein said search communication device retransmits search mode requests broadcasted by the central control device when said search communication device is not within the vicinity of the target communication device, thereby extending the broadcast range of the central control device.

10 14. The search communication device of claim 8, wherein said search communication device initiates a search for the target communication device by transmitting a search mode request to the target communication device.

15 15. The search communication device of claim 8, wherein said search communication device is a handheld device.

16. The search communication device of claim 8, wherein said search communication device is configured to be carried on a human body.

17. The search communication device of claim 8, wherein said search communication device is configured to operate in search mode onboard a moving vehicle.

20 18. The search communication device of claim 8, wherein said search communication device is capable of exchanging ranging signals with a target communication device located indoors.

19. A search communication device for pinpointing the physical position of a target communication device in a vicinity of the search communication device, comprising:

means for transmitting an outbound ranging signal to the target communication device;

25 means for receiving a reply ranging signal from the reference communication device in response to the outbound ranging signal; and

means for determining the range to the target communication device from a round-trip signal propagation time of the reply ranging signal and the outbound ranging signal, wherein said search communication device is configurable to operate in a search mode in which said search communication device repeatedly determines the range to the target communication device to enable an operator to direct movement of the search communication device toward the target communication device, thereby pinpointing the position of the target communication device by reducing the range between the search and target communication devices.

20. The search communication device of claim 19, wherein said search communication device is initially directed to a vicinity of the target communication device by an estimate of the position of the target communication device determined measurements of ranges between the target communication device and reference communication devices whose positions are known.

21. The search communication device of claim 19, wherein said search communication device is initially directed to a vicinity of the target communication device based on a position of the target communication device entered manually via a user interface.

22. The search communication device of claim 19, wherein the search mode is initiated by a broadcast search mode request transmitted by the target communication device.

23. The search communication device of claim 19, wherein the search mode is initiated by a broadcast search mode request transmitted by a central control device.

24. The search communication device of claim 23, wherein said search communication device retransmits search mode requests broadcasted by the central control device when said search communication device is not within the vicinity of the target communication device, thereby extending the broadcast range of the central control device.

25. The search communication device of claim 19, wherein said search communication device initiates a search for the target communication device by transmitting a search mode request to the target communication device.

26. The search communication device of claim 19, wherein said search communication device is a handheld device.

27. The search communication device of claim 19, wherein said search communication device is configured to be carried on a human body.

5 28. The search communication device of claim 19, wherein said search communication device is configured to operate in search mode onboard a moving vehicle.

29. The search communication device of claim 19, wherein said search communication device is capable of exchanging ranging signals with a target communication device located indoors.

10 30. A system for pinpointing the physical position of a target communication device, comprising:

a search communication device configured to transmit an outbound ranging signal and receive a reply ranging signal;

15 a target mobile communication device configured to receive the outbound ranging signal and transmit the reply ranging signal to said search communication device, said search communication device determining the range to the target communication device from a round-trip signal propagation time of the reply ranging signal and the outbound ranging signal, wherein;

20 said search and target communication devices are configurable to operate in a search mode in which said search communication device repeatedly determines the range to said target communication device to enable an operator to direct movement of said search communication device toward said target communication device, thereby pinpointing the position of said target communication device by reducing the range between said search and target communication devices.

25 31. The system of claim 30, wherein said search communication device is initially directed to a vicinity of the target communication device by an estimate of the position of the target communication device determined measurements of ranges between the target communication device and reference communication devices whose positions are known.

32. The system of claim 30, wherein said search communication device is initially directed to a vicinity of the target communication device based on a position of the target communication device entered manually via a user interface.

5 33. The system of claim 30, wherein the search mode is initiated by a broadcast search mode request transmitted by the target communication device.

34. The system of claim 30, wherein the search mode is initiated by a broadcast search mode request transmitted by a central control device.

10 35. The system of claim 34, wherein said search communication device retransmits search mode requests broadcasted by the central control device when said search communication device is not within the vicinity of the target communication device, thereby extending the broadcast range of the central control device.

36. The system of claim 30, wherein said search communication device initiates a search for the target communication device by transmitting a search mode request to the target communication device.

15 37. The system of claim 30, wherein said target communication device is a handheld device.

38. The system of claim 30, wherein said target communication device is configured to be carried on a human body.

20 39. The system of claim 30, wherein said target communication device is incorporated into clothing worn on the body.

40. The system of claim 30, wherein said target communication device is a mobile telephone.

41. The system of claim 30, wherein said search and target communication devices operate in the search mode onboard moving vehicles.

42. The system of claim 30, wherein said search and target communication devices are capable of exchanging ranging signals while indoors.

42. The system of claim 30, wherein said search and target communication devices are capable of exchanging ranging signals while indoors.